

**SOT-23**



**Pin Definition:**

1. Ground
2. RESET(RESET)
3. Vcc

### General Description

The TS809/810 series are microprocessor ( $\mu P$ ) supervisory circuit used to monitor the power supplies in  $\mu P$  and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V powered circuits. These circuits perform a single function: they assert a reset signal whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after VCC has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available. The TS809/810 series have push pull outputs. The reset comparator is designed to ignore fast transients on VCC, and the output guaranteed to be in the correct logic state for VCC down to 1V. Low supply correct makes the TS809/810 series ideal for use in portable equipment.

### Features

- Highly Accurate:  $\pm 2\%$
- Precision monitoring of +3V, +3.3V and +5V power supply voltage
- Fully specified over temperature
- Available in three output configurations
- Push-Pull RESET low output (TS809)
- Push-Pull (RESET) high output (TS810)
- 140mS min. power-on reset pulse width
- 12uA supply current
- Guaranteed reset valid to Vcc = +1V
- Power supply transient immunity
- No external components

### Ordering Information

Part No.	Package	Packing
TS809CX <sub>x</sub> RF	SOT-23	3Kpcs / 7" Reel
TS810CX <sub>x</sub> RF	SOT-23	3Kpcs / 7" Reel

Note: x is the threshold voltage type, option as

- A** : 4.63V    **B** : 4.38V    **C** : 4.00V    **D** : 3.08V  
**E** : 2.93V    **F** : 2.63V    **G** : 2.32V    **H** : 2.1V  
**I** : 2.0V

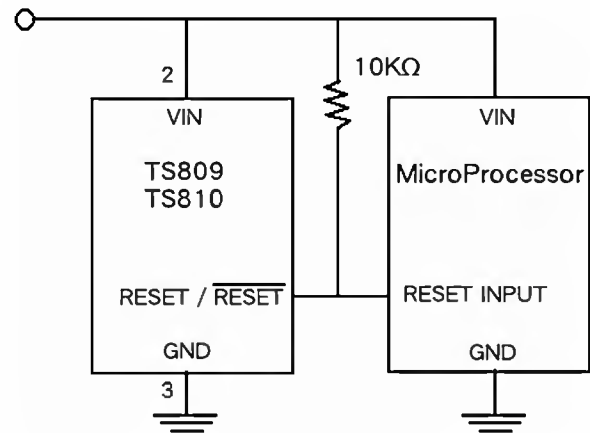
### Applications

- Battery-operated systems
- Controllers
- Intelligent instruments
- Critical uP and uC power monitoring
- Portable / Battery powered equipment
- Automotive

### Pin Descriptions

Name	Description
Gnd	Ground
<u>RESET</u> (RESET)	<u>RESET</u> – TS809 (Active Low) (RESET) – TS810 (Active High)
Vcc	Operating voltage input

### Application Circuit



Note: External pull-up resistor is required if open-drain output is used. 10k $\Omega$  is recommended.

### Absolute Maximum Rating

Parameter	Symbol	Maximum	Unit
Terminal Voltage (with respect to Gnd)	$V_{CC}$	7	V
<u>RESET</u> & (RESET) push-pull	$V_{RESET}$	-0.3 ~ ( $V_{CC} + 0.3$ )	V
Input Current, $V_{CC}$	$I_{CC}$	20	mA
Output Current, <u>RESET</u> , (RESET)	$I_o$	20	mA
Rate of Rise, $V_{CC}$	$V_R$	100	V/ $\mu$ S
Continuous Power Dissipation	$P_D$	320	mW
Operating Junction Temperature Range	$T_{OPR}$	-40 ~ +125	$^{\circ}$ C
Storage Temperature Range	$T_{STG}$	-65 ~ +150	$^{\circ}$ C
Lead Soldering Temperature (260 $^{\circ}$ C)	$T_{LEAD}$	10	S

### Electrical Specifications (Ta = 25 $^{\circ}$ C, unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Input Supply Voltage	Ta=-40 $^{\circ}$ C~+85 $^{\circ}$ C	$V_{CC}$	1.0	--	5.5	V
Supply Current	$V_{IN}=V_{IN} * 1.10$	$I_{CC}$	--	--	3.0	$\mu$ A
	$V_{IN}=V_{IN} * 1.10$ , Ta=-40 $^{\circ}$ C~+85 $^{\circ}$ C		-	--	5.0	
Reset Threshold	TS809/810CXA	$V_{TH}$	4.56	4.63	4.7	V
	TS809/810CXB		4.31	4.38	4.45	
	TS809/810CXC		3.94	4.00	4.06	
	TS809/810CXD		3.03	3.08	3.13	
	TS809/810CXE		2.89	2.93	2.97	
	TS809/810CXF		2.59	2.63	2.67	
	TS809/810CXG		2.28	2.32	2.35	
	TS809CXH		2.07	2.1	2.13	
	TS809CXI		1.97	2.0	2.03	
Reset Threshold Temperature Coefficient			30	50	160	ppm/ $^{\circ}$ C
VCC to Reset Delay	$V_{CC} = V_{TH} - 100mV$	$T_{DELAY}$	--	40	--	$\mu$ S
Reset Active Timeout Period	Ta=-40 $^{\circ}$ C~+85 $^{\circ}$ C		140	210	500	mS
RESET Output (TS809) Voltage Low	$V_{CC} < V_{TH(MAX)}$ , $I_{SINK} = 1.2mA$	$V_{OL}$	--	--	0.2	V
RESET Output (TS809) Voltage High	$V_{CC} > V_{TH(MAX)}$ , $I_{SOURCE} = 0.5mA$ , $V_{CC} > 1.8V$	$V_{OH}$	0.8	--	--	V
	$V_{CC} > V_{TH(MAX)}$ , $I_{SOURCE} = 0.15mA$ , $1.8V \geq V_{CC} > 1.0V$		VCC	--	--	
(RESET) Output (TS810) Voltage Low	$V_{CC} > V_{TH(MAX)}$ , $I_{SINK} = 1.2mA$	$V_{OL}$	--	--	0.2	V
(RESET) Output (TS810) Voltage High	$V_{CC} < V_{TH(MAX)}$ , $I_{SOURCE} = 0.5mA$ , $V_{CC} > 1.8V$	$V_{OH}$	0.8	--	--	V
	$V_{CC} > V_{TH(MAX)}$ , $I_{SOURCE} = 0.15mA$ , $1.8V \geq V_{CC} > 1.0V$		VCC	--	--	

### Application Note

#### Function Description

A microprocessor's ( $\mu P$ 's) reset input starts the  $\mu P$  in a known state. The TS809/810 assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the  $V_{CC}$  supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after  $V_{CC}$  has risen above the reset threshold. The TS809/810 have a push-pull output stage.

#### Applications Information

Negative-Going  $V_{CC}$  transients in addition to issuing a reset to the  $\mu P$  during power-up, power-down, and brownout conditions, the TS809/810 are relatively immune to short-duration negative-going  $V_{CC}$  transients (glitches).

The TS809/810 do not generate a reset pulse. The graph was generated using a negative going pulse applied to  $V_{CC}$ , starting 0.5V above the actual reset threshold and ending below it by the magnitude indicated (reset comparator overdrive). The graph indicates the maximum pulse width a negative going  $V_{CC}$  transient can have without causing a reset pulse. As the magnitude of the transient increases (goes farther below the reset threshold), the maximum allowable pulse width decreases. Typically, a  $V_{CC}$  transient that goes 100mV below the reset threshold and lasts 20 $\mu S$  or less will not cause a reset pulse. A 0.1 $\mu F$  bypass capacitor mounted as close as possible to the  $V_{CC}$  pin provides additional transient immunity.

#### Ensuring a Valid Reset Output Down to $V_{CC}=0$

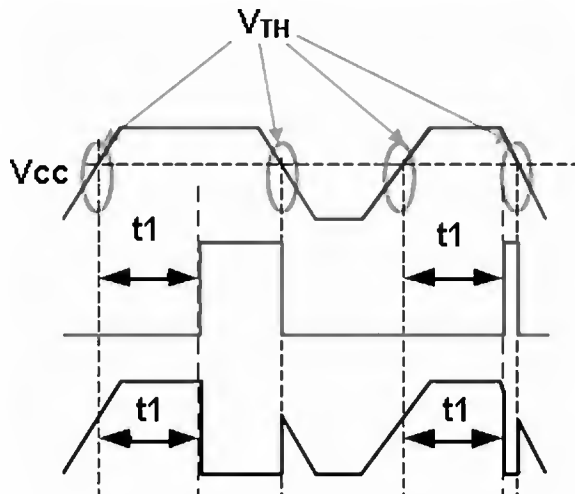
When  $V_{CC}$  falls below 1V, the TS809/810 reset output no longer sinks current - it becomes an open circuit. Therefore, high impedance CMOS logic input connected to reset can drift to undetermined voltages.

This presents no problem in most applications since most  $\mu P$  and other circuitry is inoperative with  $V_{CC}$  below 1V. However, in applications where reset must be valid down to 0V, adding a pull down resistor to reset causes and stray leakage currents to flow to ground, holding reset low (Figure 2.)  $R_1$ 's value is not critical; 100K is large enough not to load reset and small enough to pull RESET to ground. For the TS809/810 if reset is required to remain valid for  $V_{CC} < 1V$ .

#### Benefits of Highly Accurate Reset Threshold

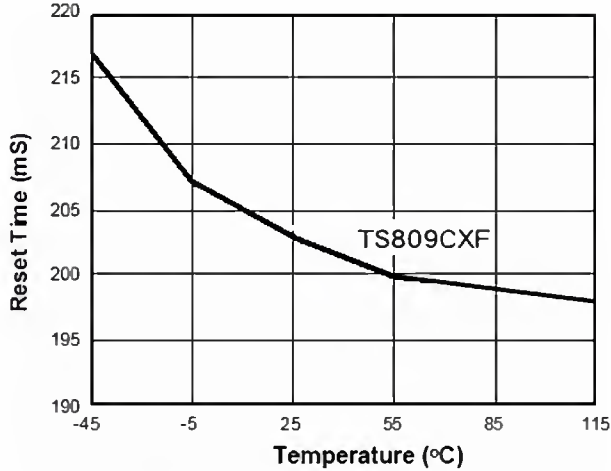
Most  $\mu P$  supervisor ICs have reset threshold voltages between 5% and 10% below the value of nominal supply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal. When using ICs rated at only the nominal supply  $\pm 5\%$ , this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted

#### Timing Diagram

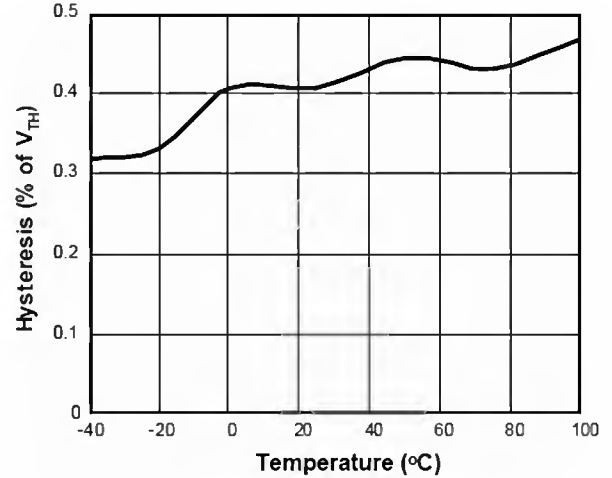


### Electrical Characteristics Curve

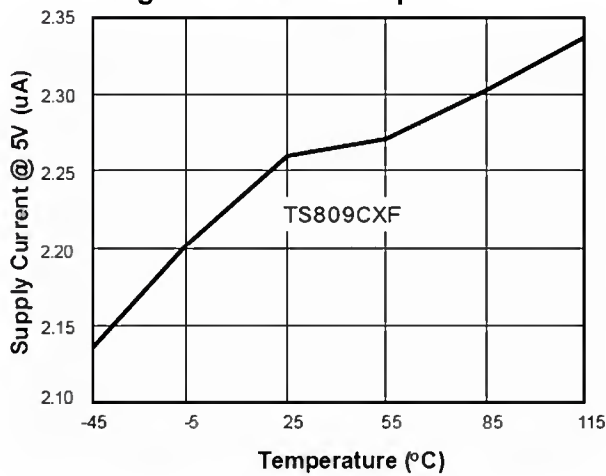
**Figure 1. Reset Time vs. Temperature**



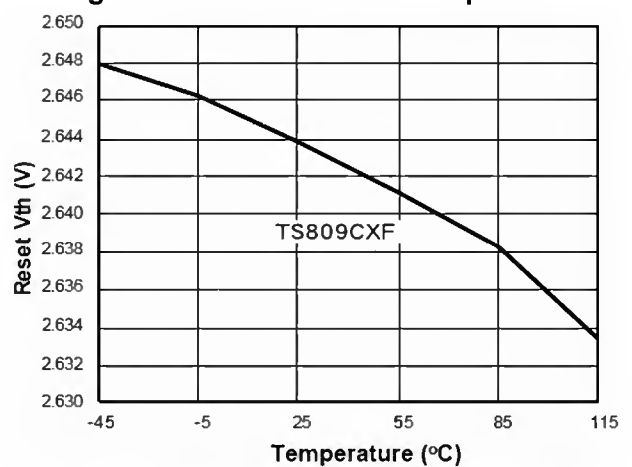
**Figure 2. Threshold vs. Temperature**



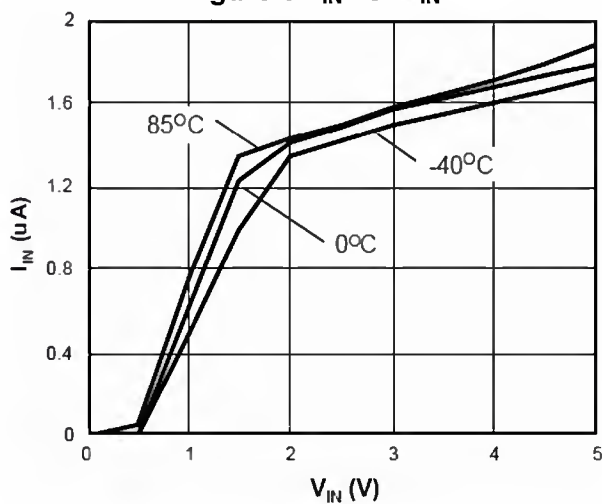
**Figure 3. I<sub>IN</sub> vs. Temperature**



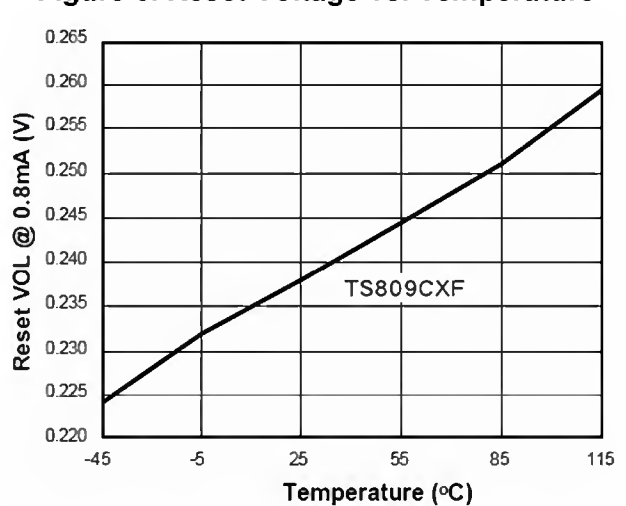
**Figure 4. Reset Time vs. Temperature**



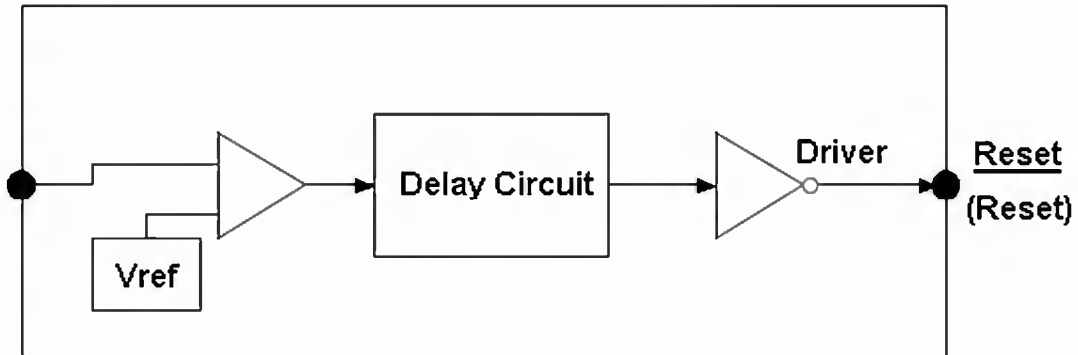
**Figure 5. I<sub>IN</sub> vs. V<sub>IN</sub>**



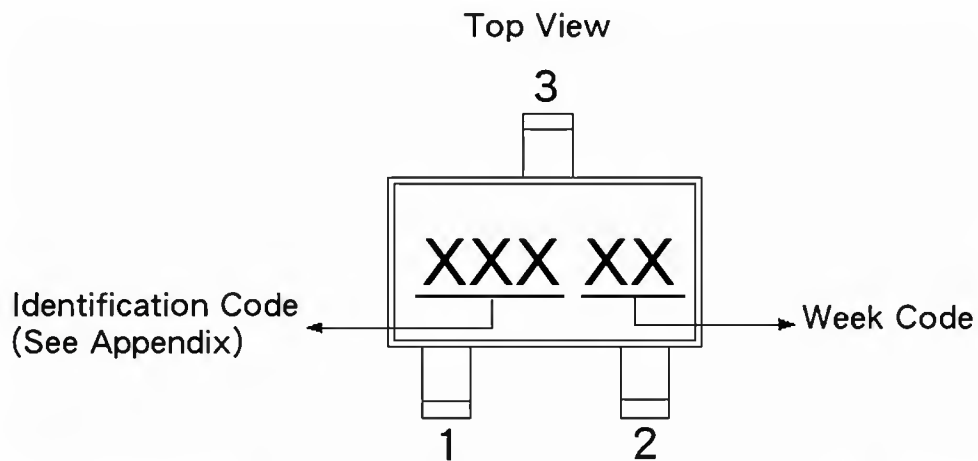
**Figure 6. Reset Voltage vs. Temperature**



### Function Block

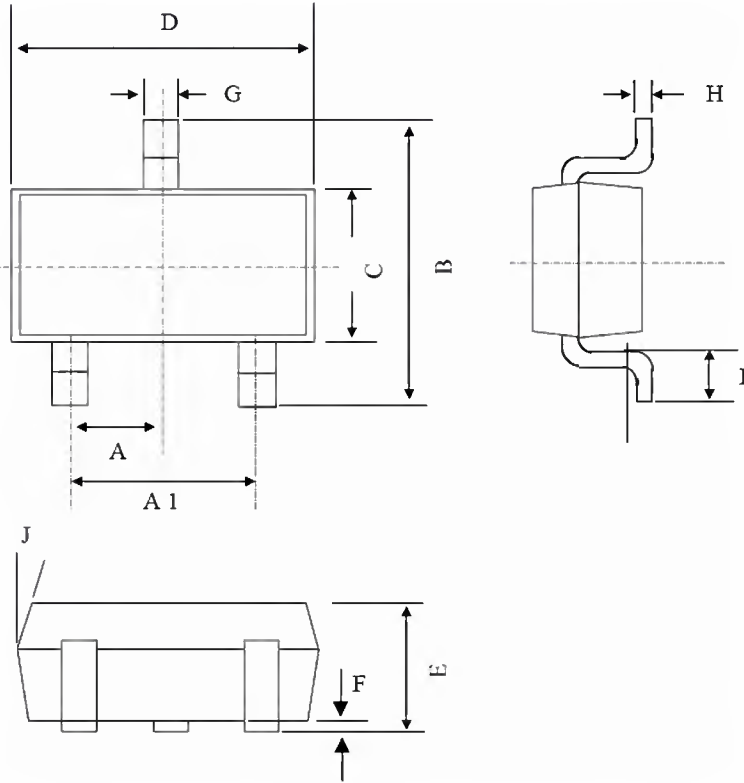


### Marking Information



Part No.	Identification Code	Part No.	Identification Code
TS809CXA	ARK	TS810CXA	ARJ
TS809CXB	ARN	TS810CXB	ALS
TS809CXC	ASB	TS810CXC	AAC
TS809CXD	ASA	TS810CXD	ASU
TS809CXE	AMO	TS810CXE	ALV
TS809CXF	AMP	TS810CXF	AZM
TS809CXG	ATT	TS810CXG	AAG
TS809CXH	ASK	--	--
TS809CXI	BDT	--	--

**SOT-23 Mechanical Drawing**



SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	0.95 BSC		0.037 BSC	
A1	1.9 BSC		0.074 BSC	
B	2.40	3.00	0.094	0.118
C	1.40	1.80	0.055	0.070
D	2.70	3.10	0.106	0.122
E	1.00	1.40	0.039	0.055
F	0.00	0.15	0.000	0.059
G	0.35	0.50	0.014	0.020
H	0.09	0.25	0.003	0.009
I	0.35 BSC		0.0138 BSC	
J	5°	10°	5°	10°

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